time clearly distinguished from that by the determination of the longitude, *por la altura del Este-Oeste.**

The importance of determining the position of the papal *line of demarkation*, and of thus fixing the limits between the possessions of the Portuguese and Spanish crowns in the newly-discovered land of Brazil, and in the group of islands in the South Indian Ocean, increased, as we have already observed, the desire for ascertaining a practical method for determining the longitude. Men perceived how rarely the ancient and imperfect method of lunar eclipses employed by Hipparchus could be applied, and the use of lunar distances was recommended as early as 1514 by the Nuremberg astronomer, Johann Werner, and soon afterward by Orontius Finæus and Gemma Frisius. Unfortunately, however, these methods also remained impracticable until, after many fruitless attempts with the instruments of Peter Apianus (Bienewitz) and Alonso de Santa Cruz, the mirror sextant was invented by the ingenuity of Newton in 1700, and was brought into use among seamen by Hadley in 1731.

The influence of the Arabian astronomers acted, through the Spaniards, on the general progress of nautical astronomy. Many methods were certainly attempted for determining the longitude, which did not succeed; and the fault of the want of success was less rarely ascribed to the incorrectness of the observation, than to errors of printing in the astronomical ephemerides of Regiomontanus which were then in use. The Portuguese even suspected the correctness of the astronomical data as given by the Spaniards, whose tables they accused of being falsified from political grounds.† The suddenly-awakened desire for the auxiliaries which nautical astronomy promised, at any rate theoretically, is most vividly expressed in the narrations of the travels of Columbus, Amerigo Vespucci, Pigafetta, and of Andreas de San Martin, the celebrated pilot of the Magellanic expedition, who was in possession of the methods of Ruy Falero for determining the longitude. Oppositions of planets, occultations of the stars, differences of altitude between the moon and Jupiter, and changes in the moon's declination, were all tried with more or less success. We possess observations of conjunction by Columbus on the night of the 13th of January, 1493, at Haiti. The necessity for at-

* Navarrete, *Coleccion de los Viages y Descubrimientos que Hicièron por mar los Españoles*, t. iv., p. xxxii. (in the *Noticia Biographica de Fernando de Magellanes*).

† Barros, Dec. iii., parte ii., p. 650 and 658–662.